

# SIEMENS

## BIANGULIX / OPTILIX

**AX**

### Installation and Setting Instructions

**Also for: OPTITOP**

**Not for:**  
**OPTILIX 154/30/50R-100**

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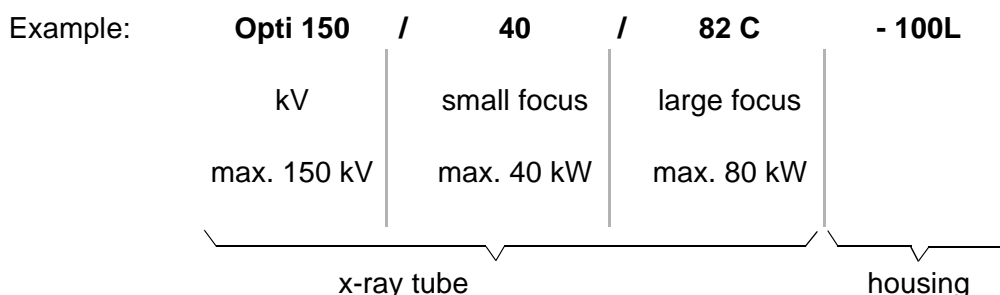
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## Safety and protective measures

- The safety notes and protective measures in the corresponding generator documents must be strictly observed.

## General information

The tube housing with built-in x-ray tube is called x-ray tube assembly. The designation of the x-ray tube assembly comprises the following.



### Explanation of the Designations:

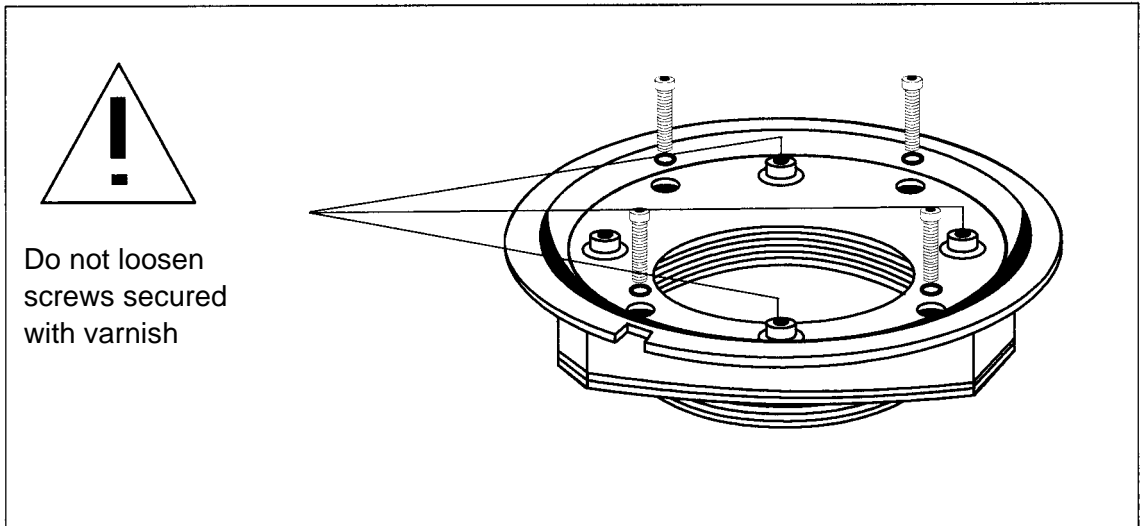
- 100:** Housing for tubes with 100 mm anode.  
Cable horns 90° to the radiation outlet
- 102:** Housing for tubes with 100 mm anode.  
Cable horns 40° to the radiation outlet
- 117:** Housing for tubes with 100 mm anode and  
150 Hz - 300 Hz rotation,  
Cable horns 90° to the radiation outlet
- G:** with 4-pole cathode plug connector
- L:** for LOADIX connection  
OPTILIX tube assemblies without the designation "L" (without LOADIX) are equipped with 3-phase stators and can only be operated on generators with starters that have been developed specifically for this.  
These tube assemblies are shown with (3 ~ ) in the list.
- ST:** for stereo mode
- C:** CALOREX graphite anode
- HS:** High-speed - 300 Hz rotation
- R:** Rapid 150 Hz rotation
- /52/72/82/102:** Anode mechanically stress-relieved

The technical data of the tube assembly are supplied with the assembly.

## Mounting the x-ray tube assembly

The installation of the x-ray tube assembly to the unit is described in the corresponding unit installation instructions.

Please observe especially the notes in the TI 376 (R71-020.038.03..., tube assembly flange adjusted at the factory).



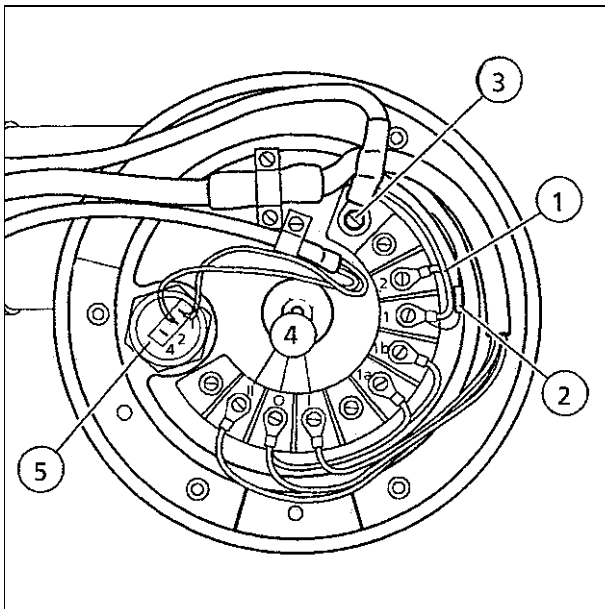


Fig. 1

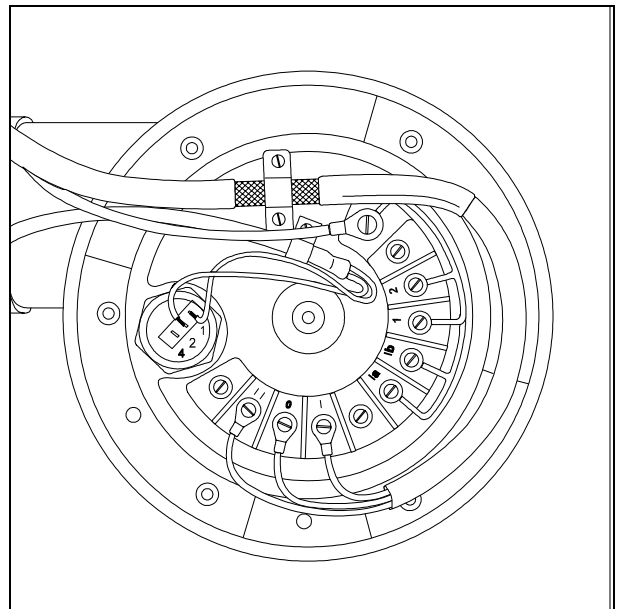


Fig. 2

## Connection to the tube assembly (on the stator side)

### 2-phase stator (Fig.1)

**II, O, I** Connection for rotating anode cable (4/Fig.1), see stator connection.  
(insulate shielding - do not connect!)  
Abweichende Angaben in den Generator Montageanleitungen sind zu beachten.

### 3-phase stator (Fig.2)

Connection of the double-shielded rotating-anode cable on the tube assembly with 3-phase stator  $U_1 = II$ ,  $V_1 = I$ ,  $W_1 = 0$  (designation in the cover)

### Controls

- 1, 2:** LOADIX measured value acquisition (only for tube assemblies with designation "L")  
Jumper 1-2-⊕ (1/Fig.1) is removed for LOADIX mode.  
The measuring resistor (2/Fig.1) is installed in the LOADIX  
(see LOADIX installation and setting instructions R71-020.033.01...).
- 1, 2, 4:** Connection of the oil pressure switch (5/Fig.1)  
- Allocation with POLYDOROS: 2+1  
- Allocation with PANDOROS: 1+4

### CAUTION

If the soldering connections for the oil pressure switch are overheated, the plastic assembly can melt, which can adversely affect the function of the switch.  
**Recommended soldering temperature: 350° C for max. 3 sec.**

**Ground wire**

Connection for  $\geq 6 \text{ mm}^2$  ground wire (3/Fig.1) to the central ground wire connection on the high-voltage generator.

**Stator connection**

Use a cable  $3 \times 0,75 \text{ mm}^2$  provided **with shielding** as stator cable.

**CAUTION**

**During the start-up phase, voltages of  $\geq 1800 \text{ V}$  can result; for this reason, use only shielded cables!**

**The shielded braiding of the stator cable is not connected on the tube assembly side, except when the double-shielded rotating-anode cable is used, or in the case of other information specified in the generator installation instructions.**

**Run cable so that it can neither be kinked nor strained with the unit in motion!**

- Secure the stator to the x-ray tube assembly using a compression clip and clamp. Secure the double-shielded rotating anode cable to the x-ray tube assembly using the clamp but not the compression clip (Fig.2) (braid to ground).

**Stator frequency 50 Hz or 150 Hz**

- Connect the stator cable to the terminal block of the x-ray tube assembly (Fig. 1) according to the provided starter (stator frequency 50/60 Hz or 150/180 Hz).
  - Observe notes on the inner side of the anode-side protective cover.
  - With 3~ stators, the stator windings are not changed over.
- Observe notes in the generator instructions and wiring diagrams. Connect starters N80, N81 and N90 generally for 150 Hz.

**Stator frequency 300 Hz (17000 rpm)**

Only **x-ray tube** assemblies which are intended for a stator frequency of 300 Hz may be connected to a 300 Hz starter. For reasons of safety, the stator in the **300 Hz tube housing "117 GL"** is switched so that the high speed (17.000 rpm) is only obtained with this tube assembly.

- For this purpose, run 2 separate shielded stator cables to the x-ray tube assembly. See also the corresponding documents referring to the 300 Hz starter.

**NOTICE**

**The connection of 150 Hz tube housings (100,102 etc.) to the 300 Hz starter results in a failure of the power safety circuit breaker in the starter!**

**Protective earthing**

- Run ground wire  $\geq 6 \text{ mm}^2$  from the tube assembly to the central ground wire connection on the high-voltage generator.

## LOADIX connection

<b>CAUTION</b>
----------------

<b>Not for three-phase stators!</b>
-------------------------------------

Terminals 1 and 2 are connected with the LOADIX measuring cell.  
To secure this measuring cell, connections 1 and 2 are provided with a jumper.

- The jumper and the adaptation resistor must be removed only on connection to the LOADIX. See LOADIX installation instructions.

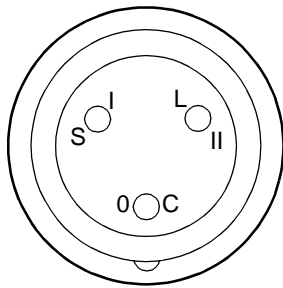
## Temperature limit value switch

When the temperature limit value is exceeded, the oil pressure switch responds and the radiation release is inhibited in the generator if the switch in the generator is connected e.g. in series with the door contact. Depending on the type of generator, an error message is output.

If the "LOADIX" is connected, the tube assembly symbol lights up and a warning signal sounds.

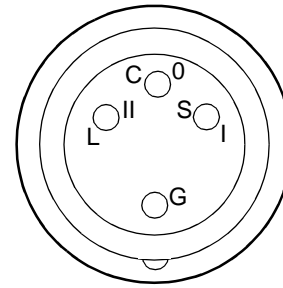
## Fan mode

- Basically, all tube assemblies can be operated with one or two fans.
- Exception: STEREOPIX
- The installation or connection of the fans is described in the fan installation instructions.



3-polig  
tripolar

Fig. 3



4-polig  
quadripolar

Fig. 4

## High-voltage connection

The tube assembly is provided with "0" plug connectors. This implies high-voltage cables with "0" sealing ends.

### NOTICE

**For installation of the high voltage cables, see the Installation Instructions, RX0-000.031.01... in the generator binder, Reg.3.**

High-voltage cables with 3-pin "0"plugs can be connected both on the anode and on the cathode side (Fig.3). With tube assemblies with final designations GL a 4-core high-voltage cable is necessary on the cathode side (Fig. 4).

If a 4-pole → 3-pole transition piece is used (supplied with part-no. 97 46 223 X1751), this may be inserted only on the high-voltage transformer side.

### NOTICE

**In order to prevent overheating of the filaments, a check must be performed with the cathotest tube phantom before insertion of the cathode-side high-voltage cable in the x-ray tube assembly**

**See the generator setting instructions and the instructions " cathode tube phantom" (TI 300 RA0-000.073.06...)**

## Pre-filtering of the x-ray tube assembly

With supply with additional filter, inherent filtering of the x-ray tube assembly is at least 2.5 mm Al equivalent. Additional filtering comprises a filter cone (0.5 mm Al) and one or two filter disks (0.5 mm Al each).

- Remove the unnecessary filter disks according to the attached collimator\*.

\* Collimators with mirror, note on "Al equivalent 1 mm" attached.

## Replacement of the additional filter

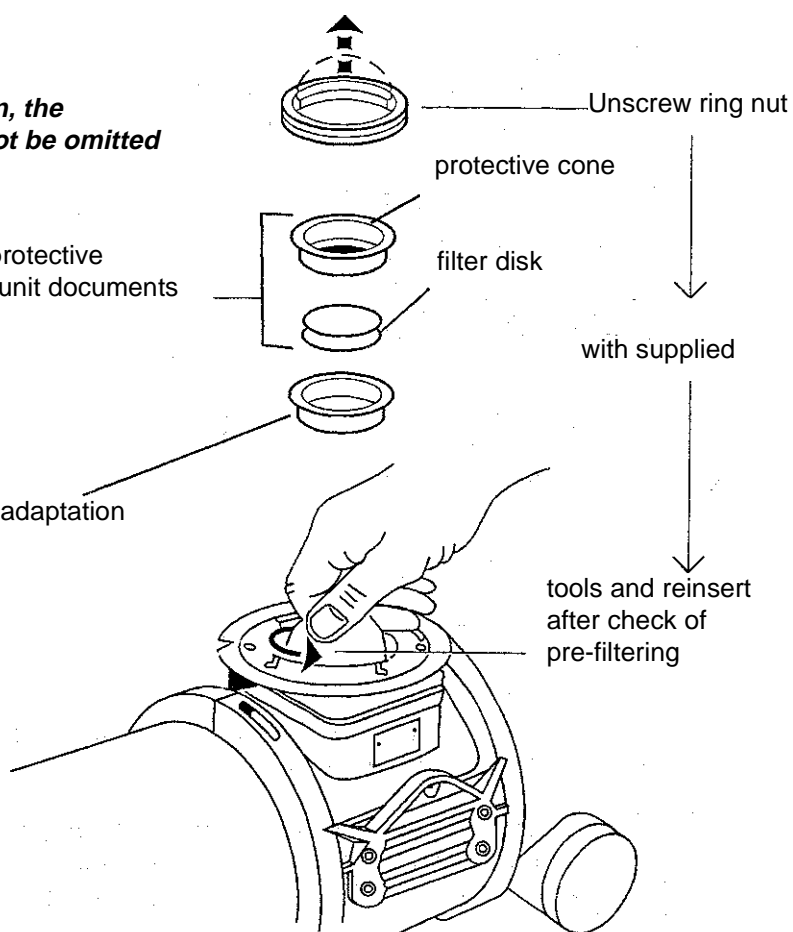
Replacement of the additional filters on the BIANGLIX, OPTILIX- and OPTITOP-tube assembly  
(not OPTILIX-HSG)

### Attention!

**With 150/180 Hz rotation, the protective cone must not be omitted**

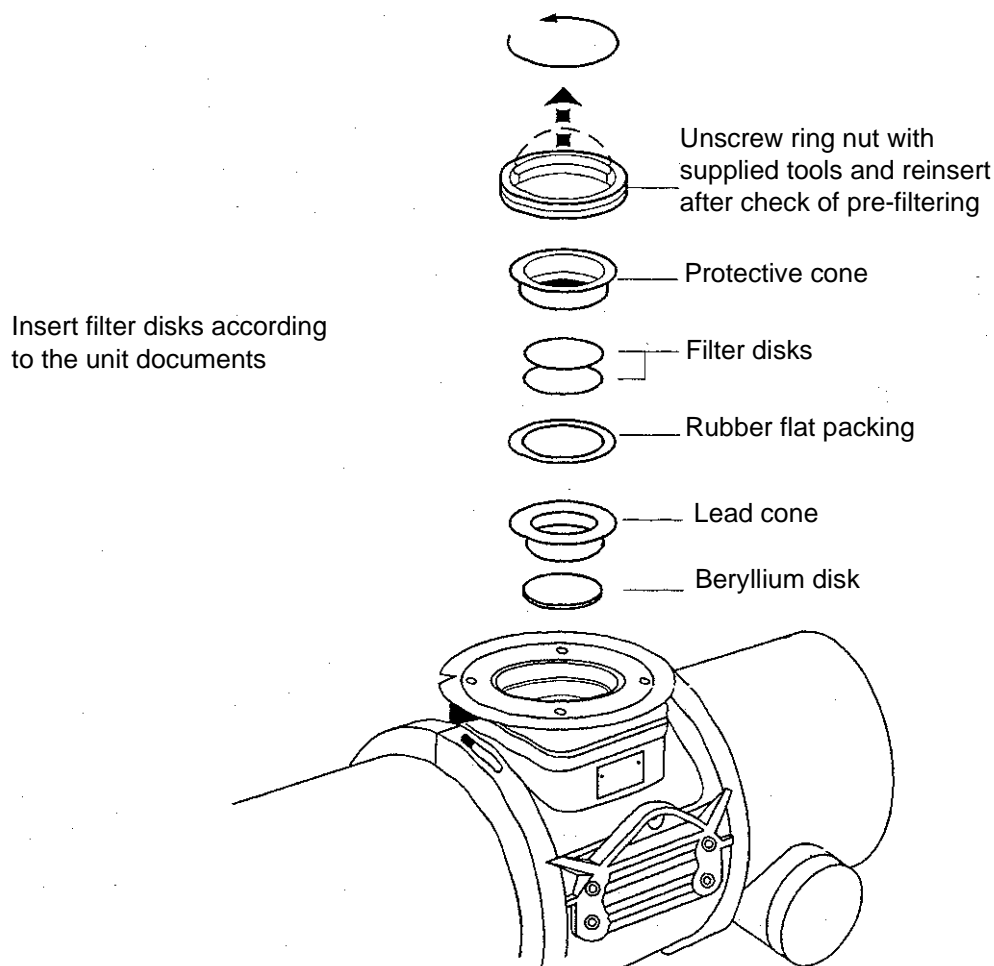
Insert filter disks and protective cone according to the unit documents

Lead cone, see I.I. adaptation



### Replacement of the additional filters on the "OPTILIX 12/50 HSG" tube assembly

For reasons of safety, the filter assembly for these tube assemblies is composed in a different way, replacement is also possible.



#### CAUTION

Neither the protective cone nor the lead cone or the beryllium disk may be omitted!  
During installation, ensure correct positioning of the seal!

## I.I.-cone adaptation

Cone diameter (openings) "d" and I.I. sizes with 80 cm source-I.I. distance are listed in the following table.

RBV	Cone opening d (mm)		
	BIANGULIX <sup>1)</sup>	OPTILIX <sup>1)</sup>	OPTILIX and OPTITOP <sup>2)</sup>
17	12	(10)	-
23	14	12	(11)
27	16	14	14
33	19	16	20
40	23	19	22

For distances  $A_x$  (cm) deviating from 80 cm, the necessary cone openings  $d_x$  (mm) can be calculated.

$$d_x \text{ (mm)} = \frac{80 \text{ cm}}{A_x \text{ cm}} \times d \text{ (mm)}$$

"Diameters" not contained in the cone sets can be obtained by boring open.

- 1) Cone set, part no. 81 92 353 X1122: Ø 3, 12, 14, 16, 19, 23 mm must be ordered separately for BIANULIX or OPTILIX (without Opti 40/73 C).
- 2) Cone set, part no. 89 52 699 X1953: Ø 3, 14, 20, 22 mm must be ordered separately for tube assembly OPTILIX 150/40/73C-100...and OPTITOP 150/40/80 HC-100...

## Primary leaves

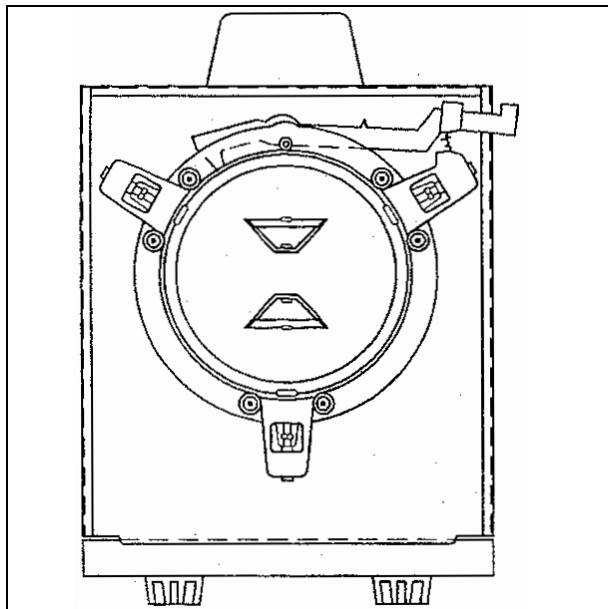


Fig. 5

Basically, the primary leaves must be positioned parallel to the tube axis.

Exception: STEREOPIX

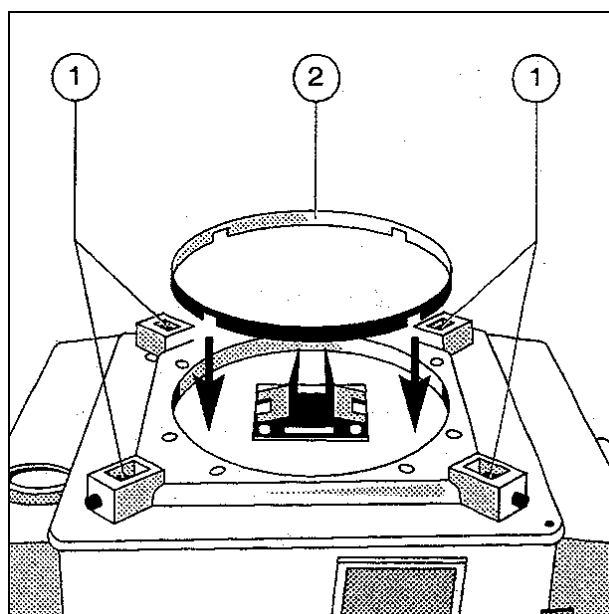


Fig. 6

In order to facilitate the adjustment of older collimator types, the adjustment ring (2) has been created for attachment to the tube assembly with radiation output flange adjusted at the factory.

### Prerequisite:

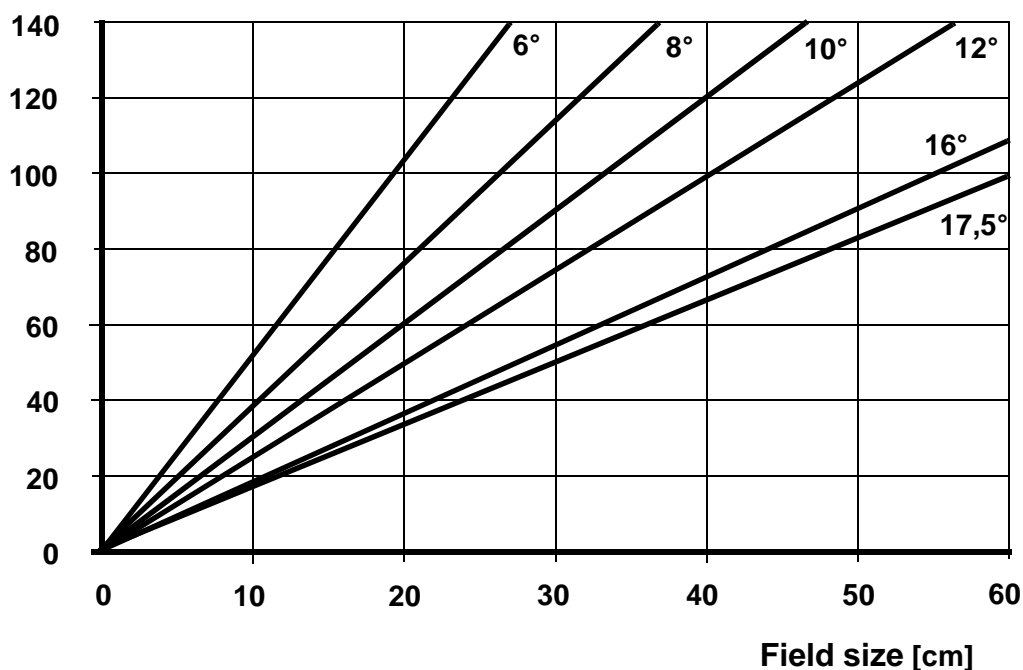
Mirror and light localizer lamp must be adjusted correctly.

The recesses must be positioned above the clamping slides (1) (adjustment ring has a very firm seat).

## Useful radiation field

Depending on the source-image distance and the anode inclination angle, certain film formats are exposed. See diagram.

SID [cm]



Field size [cm] on radiation receptor in the longitudinal axis of tube:

$$= 2 \times \tan \alpha \times \text{SID}$$

$\tan \alpha$  = Tangent of target angle

SID = Source-image (radiation receptor) distance

$\alpha$	$\tan \alpha$
6,0°	= 0,105
7,5°	= 0,132
8,0°	= 0,141
10,0°	= 0,176
12,0°	= 0,216
16,0°	= 0,287
17,5°	= 0,315
21,0°	= 0,384

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## Startup of the tube assembly with high voltage

### Referring to "Setting the tube pre-heating":

- Perform setting of the tube pre-heating according to the corresponding generator setting instructions.  
Depending on the generator, the tube assembly can be warmed up before setting the tube pre-heating.  
Pre-heating must be performed.  
With generators without this function, the tube assembly must be warmed up as follows after setting the pre-heating:

- Switch on fluoroscopy at lowest kV stage
- Adjust up to 110 kV, 4.1 mA within approx. 1 min
- Leave fluoroscopy switched on for 10 min  
Monitor kV and mA on the oscilloscope

In the case of malfunctions (ignition of the tube), fluoroscopy must be performed for a longer time at a reduced kV value. Only then may the kV value be increased. If fluoroscopy is working without any malfunctions, begin adjustment of the exposure heating.

If operation is not possible without any malfunctions in spite of longer fluoroscopy, the tube assembly must be replaced.

### Referring to "Setting the exposure heating":

- Perform setting of the exposure heating according to the corresponding generator setting instructions.

## Service notes

### Determination of the stator winding resistance

In the case of malfunctions in the rotating anode run, the stator can be checked as follows.

Connect ohmmeter to the anode side and compare resistance values as follows.

### X-ray tube assembly with 1-phase stator

Test points	BIANGULIX (50 Hz) (2 800...3 500 $\frac{1}{\text{min}}$ )			BIANGULIX-Rapid, OPTITOP and OPTILIX (150 Hz) (8 500...10 000 $\frac{1}{\text{min}}$ )			OPTILIX - HSG (300 Hz) (17 000 $\frac{1}{\text{min}}$ )	
	0 - I	0 - II	I - II	0 - I	0 - II	I - II	0 - II	I/I <sub>B</sub> - 1 <sub>A</sub>
Winding resistance ( $\Omega$ )	70-80	13-16	83-96	18-20	13-16	31-36	14-16	18-20

### X-ray tube assembly with three-phase stator

Test points	OPTITOP and OPTILIX... -100 (150 Hz) (8 500...10 000 $\frac{1}{\text{min}}$ )		
	0 - I	0 - II	I - II
Winding resistance ( $\Omega$ )	2,0-2,6	2,0-2,6	2,0-2,6

Chap. 0      Revision level and Table of Contents updated.

Chap. 2

Page 1      "Caution" new included

Chap. 4      Updated

TD PS 21 / Link  
TD SD 31 / Kern R., Tropa